

## Refine Search

### Search Results -

Term	Documents
(16 AND 23).USPT.	0
(L16 AND L23 ).USPT.	0

Database:

US Pre-Grant Publication Full-Text Database  
 US Patents Full-Text Database  
 US OCR Full-Text Database  
 EPO Abstracts Database  
 JPO Abstracts Database  
 Derwent World Patents Index  
 IBM Technical Disclosure Bulletins

Search:

L25

Refine Search

Recall Text

Clear

Interrupt

### Search History

 DATE: Friday, March 19, 2004    [Printable Copy](#)    [Create Case](#)
**Set Name Query**

side by side

**Hit Count Set Name**

result set

*DB=USPT; PLUR=YES; OP=OR*

<u>L25</u>	116 and L23	0	<u>L25</u>
<u>L24</u>	117 and L23	0	<u>L24</u>
<u>L23</u>	13 and L22	34	<u>L23</u>
<u>L22</u>	wt and L2	119	<u>L22</u>
<u>L21</u>	114 and L20	0	<u>L21</u>
<u>L20</u>	wt and L6	27	<u>L20</u>
<u>L19</u>	116 and L18	2	<u>L19</u>
<u>L18</u>	wt and L14	133	<u>L18</u>
<u>L17</u>	glassy and L16	0	<u>L17</u>
<u>L16</u>	viscoelastic and L15	2	<u>L16</u>
<u>L15</u>	damp\$6 and L14	11	<u>L15</u>
<u>L14</u>	(structural adj lamin\$6) and impregnat\$5	156	<u>L14</u>
<u>L13</u>	(structural adj lamina) and 19	0	<u>L13</u>

<u>L12</u>	(structural adj lamina) and L3	0	<u>L12</u>
<u>L11</u>	l6 and L9	2	<u>L11</u>
<u>L10</u>	l3 and L9	6	<u>L10</u>
<u>L9</u>	l2 and L8	12	<u>L9</u>
<u>L8</u>	thermosetting adj resin	22228	<u>L8</u>
<u>L7</u>	glassy and L6	1	<u>L7</u>
<u>L6</u>	viscoelastic and l2	31	<u>L6</u>
<u>L5</u>	plastisizer and L1	4	<u>L5</u>
<u>L4</u>	plastisizer and L3	0	<u>L4</u>
<u>L3</u>	impregnat\$5 and L2	37	<u>L3</u>
<u>L2</u>	(composite adj laminat\$5) and L1	137	<u>L2</u>
<u>L1</u>	damping	58250	<u>L1</u>

END OF SEARCH HISTORY

First Hit   Fwd Refs

Generate Collection

Print

L16: Entry 1 of 2

File: USPT

Apr 20, 1999

DOCUMENT-IDENTIFIER: US 5894651 A

TITLE: Method for encapsulating a ceramic device for embedding in composite structures

Abstract Text (1):

A piezoelectric actuator/sensor package and corresponding method for its fabrication, and a method of embedding a ceramic actuator/sensor in a laminated structural member, such as a graphite-epoxy laminate. A ceramic actuator/sensor, with lead wires first bonded to it, is encapsulated in a non-conductive fiber composite material, such as fiberglass cloth and epoxy, to form a package that is precured at a suitable temperature, typically room temperature. Encapsulation provides electrical insulation, good strain coupling, protection from mechanical damage, and reduction in thermal stresses, since the coefficient of thermal expansion of the encapsulating material is selected to be between those of the ceramic and the graphite-epoxy laminate. Graphite fibers may be added to the package to enhance voltage-strain performance. The package is embedded in the structural laminate and the composite structure is cured in a manner that minimizes thermally-induced stresses. Piezoelectric prestressing, during the embedment step, may be used to further reduce the effects of thermal stresses.

Brief Summary Text (3):

Passive energy dissipation typically uses layers of viscoelastic materials, either embedded in structural members or applied at structural joints. Viscoelastic materials have the useful property that their stiffness increases with the rate at which they are mechanically stressed. Therefore, a viscoelastic member is subject to relatively high damping forces when vibrating rapidly, and lower damping forces when deformed more slowly. Although significant levels of damping can be obtained by passive means, static strength is reduced by the presence of the viscoelastic materials, since structural members must be reduced in stiffness at certain locations in order to introduce energy into the viscoelastic material. Also, since the properties of viscoelastic materials are highly temperature dependent, a thermal control system must be used in space structures, to maintain them at the desired operating conditions. This is costly in terms of both power consumption and weight, and in some cases thermal control is not possible at all.

Brief Summary Text (4):

The active damping approach employs actuators, which, operating in conjunction with deformation sensors, apply damping forces to compensate for vibrational and other loading forces on structures. Static structural strength and stiffness are not compromised by active damping, and many ceramic actuator materials can retain their properties over a much larger temperature range than passive damping structures. In many cases thermal control systems are not needed if active damping is used.

Brief Summary Text (5):

The principal difficulty with actively damped structures is that of embedding ceramic actuators in composite materials. The most efficient actuator materials are piezoelectric ceramics, such as lead zirconate titanate (PZT), and electrostrictive ceramics, such as lead molybdenum niobate (PMN). Piezoelectric materials can be used as actuators, since a voltage applied to them causes structural deformation in

a selected direction, or as sensors, whereby a deformation in a selected direction induces a measurable voltage. Unfortunately, most ceramic materials are relatively brittle and have a large positive coefficient of thermal expansion (CTE). Graphite fiber-reinforced epoxies have a zero or slightly negative CTE. When a graphite fiber reinforced epoxy is cured at elevated temperatures, and subsequently cooled, tensile stresses are induced in the embedded ceramic materials. Resultant cracking will degrade ceramic actuator performance significantly, if not totally. Another difficulty is the need to insulate actuators electrically from conductive graphite fibers in the composite materials in which the actuators are embedded. Ceramic actuators and sensors have two electroplated surfaces with attached connecting leads that must be insulated. Yet another problem is the inherent fragility of the actuators, which may lead to breakage even prior to embedment in a composite structure.

Brief Summary Text (7):

It will be appreciated from the foregoing that there is still a need for improvement in the field of piezoelectric ceramic sensors and actuators as applied to active damping of composite structures. The present invention is directed to this this end.

Detailed Description Text (8):

An alternate encapsulating material 20 is a pre-impregnated fiberglass or KEVLAR (manufactured by DuPont) cloth having a low temperature curing epoxy resin, preferably less than 250.degree.. The resin content of the insulating cloth should be high, greater than 50% by weight. A high resin content forms an epoxy matrix that coats the fibers and fills in gaps in the fabric weave that would otherwise form pinholes in the package. A high resin content is also desirable to provide desired mechanical properties, such as a relatively high CTE, which can be controlled to some degree by the specific resin content used.

CLAIMS:

5. An actuator/sensor package as defined in claim 1, wherein:

the encapsulating material is KEVLAR impregnated with epoxy.

TITLE: Structural panel and method of manufacture

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw De
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☐ 5. Document ID: US 5894651 A

L15: Entry 5 of 11

File: USPT

Apr 20, 1999

US-PAT-NO: 5894651

DOCUMENT-IDENTIFIER: US 5894651 A

TITLE: Method for encapsulating a ceramic device for embedding in composite structures

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw De
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☐ 6. Document ID: US 5830548 A

L15: Entry 6 of 11

File: USPT

Nov 3, 1998

US-PAT-NO: 5830548

DOCUMENT-IDENTIFIER: US 5830548 A

**\*\* See image for Certificate of Correction \*\***

TITLE: Articles of manufacture and methods for manufacturing laminate structures including inorganically filled sheets

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw De
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☐ 7. Document ID: US 5305507 A

L15: Entry 7 of 11

File: USPT

Apr 26, 1994

US-PAT-NO: 5305507

DOCUMENT-IDENTIFIER: US 5305507 A

TITLE: Method for encapsulating a ceramic device for embedding in composite structures

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw De
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☐ 8. Document ID: US 5268055 A

L15: Entry 8 of 11

File: USPT

Dec 7, 1993

US-PAT-NO: 5268055

DOCUMENT-IDENTIFIER: US 5268055 A

TITLE: Method for making perforated composite laminates

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMIC	Drawn De
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☐ 9. Document ID: US 4783363 A

L15: Entry 9 of 11

File: USPT

Nov 8, 1988

US-PAT-NO: 4783363

DOCUMENT-IDENTIFIER: US 4783363 A

TITLE: Curable compositions containing a polyepoxide and a halogenated bisphenol

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMIC	Drawn De
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☐ 10. Document ID: US 4461666 A

L15: Entry 10 of 11

File: USPT

Jul 24, 1984

US-PAT-NO: 4461666

DOCUMENT-IDENTIFIER: US 4461666 A

TITLE: Contoured balsa-core laminate

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMIC	Drawn De
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☐ 11. Document ID: US 4234190 A

L15: Entry 11 of 11

File: USPT

Nov 18, 1980

US-PAT-NO: 4234190

DOCUMENT-IDENTIFIER: US 4234190 A

**\*\* See image for Certificate of Correction \*\***

TITLE: Carbon fiber-reinforced plastic arrow

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMIC	Drawn De
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Clear

Generate Collection

Print

Fwd Refs

Bkwd Refs

Generate OACS

Term	Documents
DAMP\$6	0
DAMP	22801
DAMPA	2
DAMPABLE	20
DAMPADD	1

DAMPAER	1
DAMAGE	1
DAMPAGED	1
DAMPALA	2
DAMPANED	3
DAMPANT	2
(DAMP\$6 AND L14).USPT.	11

[There are more results than shown above. Click here to view the entire set.](#)

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**Display Format:**

Tl

Change Format

[Previous Page](#)

[Next Page](#)

[Go to Doc#](#)

## Hit List

Clear	Generate Collection	Print	Fwd Refs	Bkwd Refs
Generate OACS				

Search Results - Record(s) 1 through 1 of 1 returned.

☐ 1. Document ID: US 6664359 B1

L7: Entry 1 of 1

File: USPT

Dec 16, 2003

US-PAT-NO: 6664359

DOCUMENT-IDENTIFIER: US 6664359 B1

TITLE: Tackified polydiorganosiloxane polyurea segmented copolymers and a process for making same

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMC	Draw D
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Clear	Generate Collection	Print	Fwd Refs	Bkwd Refs
Generate OACS				

Term	Documents
GLASSY	16431
GLASSIES	0
GLASSYS	0
(6 AND GLASSY).USPT.	1
(GLASSY AND L6).USPT.	1

Display Format:

Change Format

[Previous Page](#)

[Next Page](#)

[Go to Doc#](#)



First Hit   Fwd Refs



Generate Collection

Print

L11: Entry 1 of 2

File: USPT

Jan 6, 2004

DOCUMENT-IDENTIFIER: US 6675112 B1

TITLE: Cure monitoring

Brief Summary Text (2):

This invention relates to the monitoring of solidification of plastics resins, and in particular relates to monitoring the curing of adhesively bonded or sealed joints, monitoring the cure of thermosetting resins and monitoring the cure of composite materials comprising plastics resins.

Brief Summary Text (30):

By correlating the output signal behaviour with a database of known behaviour for individual materials or structures particular physical, mechanical or chemical properties of the resins may be obtained sampled or monitored over a time period. This can be used to provide data useful for indicating when to apply pressure to bonds or composite laminates, or when pressure may be released or products released from moulds. The skilled person will be able to make wide use of the present invention in the field of polymer processing.

Detailed Description Text (10):

At an initial liquid phase, the resonant frequency of the bond is low and the signal amplitude high but changing slightly. This suggests that the resin is in an initial liquid phase with some reaction occurring producing slight changes in viscosity of the resin. It should be noted at this point that the transducers used in the experiment only measure movement in a vertical direction. The signal amplitude values associated with a bond containing uniform liquid resin are very much smaller than those associated with a void, due to the viscoelastic damping effects of the viscous resin.

## Hit List

Clear	Generate Collection	Print	Fwd Refs	Bkwd Refs
Generate OACS				

Search Results - Record(s) 1 through 2 of 2 returned.

☐ 1. Document ID: US 6675112 B1

L11: Entry 1 of 2

File: USPT

Jan 6, 2004

US-PAT-NO: 6675112

DOCUMENT-IDENTIFIER: US 6675112 B1

TITLE: Cure monitoring

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw De
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☐ 2. Document ID: US 4223073 A

L11: Entry 2 of 2

File: USPT

Sep 16, 1980

US-PAT-NO: 4223073

DOCUMENT-IDENTIFIER: US 4223073 A

**\*\* See image for Certificate of Correction \*\***

TITLE: High-temperature damping composite

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw De
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Clear	Generate Collection	Print	Fwd Refs	Bkwd Refs
Generate OACS				

Term	Documents
(9 AND 6).USPT.	2
(L6 AND L9).USPT.	2

Display Format:

Change Format

[Previous Page](#)

[Next Page](#)

[Go to Doc#](#)

## Hit List

Clear	Generate Collection	Print	Fwd Refs	Bkwd Refs
Generate OACS				

Search Results - Record(s) 1 through 11 of 11 returned.

☐ 1. Document ID: US 6696164 B2

L15: Entry 1 of 11

File: USPT

Feb 24, 2004

US-PAT-NO: 6696164

DOCUMENT-IDENTIFIER: US 6696164 B2

TITLE: Structural panel and method of manufacture

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw De
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☐ 2. Document ID: US 6546694 B2

L15: Entry 2 of 11

File: USPT

Apr 15, 2003

US-PAT-NO: 6546694

DOCUMENT-IDENTIFIER: US 6546694 B2

TITLE: Light-weight structural panel

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw De
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☐ 3. Document ID: US 6419774 B1

L15: Entry 3 of 11

File: USPT

Jul 16, 2002

US-PAT-NO: 6419774

DOCUMENT-IDENTIFIER: US 6419774 B1

TITLE: Structural panel and method of manufacture

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw De
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☐ 4. Document ID: US 6171705 B1

L15: Entry 4 of 11

File: USPT

Jan 9, 2001

US-PAT-NO: 6171705

DOCUMENT-IDENTIFIER: US 6171705 B1